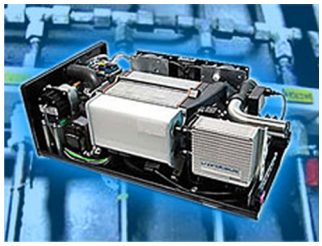
John F. Kennedy Space Center's Chemochromic Hypergol Sensors



The National Aeronautics and Space Administration (NASA) seeks partners interested in the commercial application of the Chemochromic Hypergol Sensors technology. NASA's Kennedy Space Center (KSC) is soliciting licensees for this innovative technology. The Chemochromic Hypergol Sensors technology consists of chemochromic pigments incorporated into various matrices (e.g., tapes, sheets, injection molded parts, fibers).

When placed near strategic locations such as piping and container valves, seams, and joints, these sensors provide an instantaneous, distinct color change from yellow to black indicating the presence of hypergols at the leak location. The chemochromic pigments can be incorporated into fibers used to make fabrics for personal protective equipment as well as into badge holders for use as a point leak detector. These affordable, easily replaceable sensors provide the capability to visually monitor leak-prone locations and personnel working in those areas on a continuous basis for the presence of dangerous hypergols.

BENEFITS

- Precision – when placed in contact with exposed hardware, sensors indicate the exact location of hypergol leaks, which makes localization and repair of leaks much easier and quicker for maintenance technicians.
- Versatility – technology can be used as either an area monitoring sensor or a point source sensor. Sensor size and shape can be tailored to specific tasks. Sensors can also be used to detect hydrazine in solution.
- Affordability – incorporation of the technology into various matrices can be accomplished with a very low implementation cost.
- Safety – color change in sensors provides an instantaneous, visible warning of the presence of hypergols. This warning facilitates an immediate evacuation of personnel from the contaminated area to a safe distance. Pigment in the sensor traps hypergols, thus helping prevent escape of the hypergol into the surrounding atmosphere.

opportunity

APPLICATIONS

- Space Vehicle Operations
- Propellants
- Power Plants
- Polymers
- Fuel Cells
- Metallurgy
- Explosives
- Pesticides
- Pharmaceuticals

TECHNOLOGY STATUS

- ☑ Patent pending
- ☐ U.S. patent
- ☐ Copyrighted
- ☑ Available to license
- ☐ Available for no-cost transfer
- ☐ Seeking industry partner for further codevelopment

Technology Details

Hypergol detection is difficult due to the low level of detection required, the time response of the sensors, and the reactivity of the commodity. Hypergolic fuels often “stick” to the inside of sampling lines or react with water, affecting the level of detection possible with traditional sensors. Area sensors can be used to monitor wide areas but require the commodity to reach the sensor in a quantity that can be detected.

Technicians often report “catching a whiff” of hydrazine while their handheld monitor reads zero. Trying to identify leaks with area monitors is a difficult task because of the complications of dilution with air movement. The high cost, slow response/recovery times, and required maintenance of area sensors make them impractical for widespread use in all areas that use hypergolic fuels. Intermittent problems may also go unnoticed if there is a leak from an area that is not constantly monitored.

KSC’s improved sensor incorporates chemochromic pigments into various polymer matrices (e.g., tapes, sheets, injection molded parts, fibers), allowing the hypergol sensors to be molded into nearly any type of shape that is required. The extrusion techniques used to manufacture the sensors allow both powders and liquids to be incorporated into the polymer matrices.

When applied directly to piping and container valves, seams, and joints, hypergol leaks trigger an instantaneous color change on the sensor indicating the precise location of the leak. This makes localizing and repairing leaks much quicker and easier for maintenance technicians. When located directly over a leak, the chemochromic pigment used in the sensor traps the hypergol and prevents it from escaping into the surrounding atmosphere.

These sensors are designed to be easy to replace and to have a low cost of implementation. If used as a tape, the sensor can be designed to have several layers to protect it from environmental conditions or to utilize reusable adhesive to allow repositioning of the sensor.

Partnership Opportunities

All NASA licenses are individually negotiated with the prospective licensee, and each license contains terms concerning commercialization (practical application), license duration, royalties, and periodic reporting. NASA patent licenses may be exclusive, partially exclusive, or nonexclusive. If your company is interested in the Chemochromic Hypergol Sensors technology, or for additional information, reference Case Number KSC-13636 and contact:

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